



Mobile applications developed for children and adolescents experiencing chronic health conditions: an integrative review

Aplicativos móveis desenvolvidos para crianças e adolescentes que vivem com doenças crônicas: uma revisão integrativa (resumo: p. 17)

Aplicaciones móviles desarrolladas para niños y adolescentes en condición crónica de salud: una revisión integradora (resumen: p. 17)

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This paper presents the results of an integrative literature review regarding the methods to develop mobile applications for children and adolescents experiencing chronic health conditions. The analyzed manuscripts were available on MEDLINE/PubMed, Web of Science, SciELO, LILACS and EMBASE, over a period from 2010 to 2020. We identified 87 manuscripts in the databases and 8 of them attended the inclusion and quality criteria. It was observed that the use of humor, gamification, simple language and attractive visuals arouse interest and facilitated the use of the application. The examined literature evidenced that the development of applications for children and adolescents must recognize the needs of users, considering them in the creation process. Mobile health applications favored adherence and self-care and were important allies in the care of chronically ill children and adolescents.

Keywords: Mobile applications. Chronic diseases. Treatment.



Introduction

Information and Communication Technologies (ICTs) evolved into an important tool for health care, contributing to the dissemination and updating of knowledge and assisting in the professionals' clinical decision-making. These technologies use mobile devices (cell phones, tablets etc.) and support in a decisive way the transformation of the way of how patients face their conditions, in their relationship with health professionals and in self-care^{1,2}. The World Health Organization (WHO) considers the issue so urgent that it has created a World eHealth Observatory to assist in the implementation of eHealth in countries³.

Data produced by the National Household Sample Survey (PNAD), conducted in Brazil in 2017, found that about 93% of households had mobile devices⁴. In a survey conducted in Brazil, it was found that 86% of respondents search the internet for information about their health, a percentage this higher than to medical opinion or specialists that was 74%⁵.

There is a significant and progressive increase in the use of the internet by people with chronic health conditions, and these are the ones who most use the internet for health information when compared to other patients⁶. Chronic conditions begin gradually, have an indeterminate and long prognosis, and their duration and clinical conditions vary over time and require continuous care with frequent interventions that can be articulated through the use of technologies^{5,7}.

The idea that young people rarely get sick has limited the health care of children and adolescents and consequently the advancement of research in this area. In addition to heredity, the environment where people live, socioeconomic conditions, habits, and lifestyle are determining and conditioning factors of individual health. It has been observed that eating and physical activity habits among children and adolescents have caused early health problems, leading to an increase in chronic diseases and mental disorders^{5,8,9}.

The number of children and adolescents with at least one chronic health condition has been increasing. In Brazil, the PNAD/2008, revealed that the rate of chronic diseases in children aged 0 to 5 years was 9.1%, in children aged 06 to 13 years it was 9.7% and in adolescents aged 14 to 19 years the rate reached 11%. In a population-based study conducted in São Paulo in 2013, the prevalence of chronic disease among adolescents was 19.17%. Asthma is the most prevalent chronic disease, while diabetes mellitus has the largest incidence^{5,10}.

The multifunctionality and remote home support via mobile applications allows the improvement of knowledge and skills for the management of chronic disease, through reminders for the use of medications and therapeutic diaries¹¹. In recent years, it has been possible to observe an increase in mobile applications directed to this purpose, which are collaborating to the creation of a new type of health care, especially in places with low resources, difficult access to health services and shortage of professionals, in which the health information of users becomes timely and ubiquitous, reducing risks and increasing health outcomes².



Contrasting the wide availability of applications, there is a lack of data on the methodology for developing these tools, especially those directed to children and adolescents with chronic diseases. This population presents its own characteristics related to its health condition that often imposes a routine of treatments, use of health technologies, successive readmissions, etc.

In view of these considerations, the objective of this work was to perform an integrative review of methods and models of development and implementation of applications for children and adolescents with chronic diseases.

Method

The present study is an integrative literature review of papers published in journals indexed in the following databases: MEDLINE/PubMed, Web of Science, SciELO, LILACS and EMBASE, from 2010 to 2020. The search strategy applied to the research question is described in Frame 1.

Frame 1. Search strategy applied to the research question*

Data base	Search terms	Studies found
Pubmed/Medline	((aplicativos móveis) AND (doença crônica)) AND (tratamento) ((mobile application) AND (chronic disease)) AND (treatment)	41 articles
Lilacs	Aplicativos móveis [words] AND doença crônica [words] mobile application [words] AND chronic disease [words]	2 articles
Web of Science	((TS=(mobile applications AND chronic disease AND treatment AND child)))	14 articles
Embase	('mobile application'/exp OR 'mobile application') AND ('chronic disease'/exp OR 'chronic disease') AND ('treatment'/exp OR treatment)	30 articles
SciELO	Aplicativos moveis [all indexes] and doença crônica [all indexes] and tratamento [all indexes] mobile application [all indexes] and chronic disease [all indexes]	0 articles

*Filtered by: 2010-2020, Full text, Humans, English, Portuguese, Spanish, Child: birth-18 years.

The integrative review aims to gather studies on a given topic, integrating opinions, concepts or ideas, thus allowing a synthesis of the scientific knowledge produced at a certain moment. This review method is broader when compared to systematic or narrative literature reviews, since it allows the inclusion of studies with a quantitative as well as qualitative approach in order to provide a broader view of the analyzed construct. For this work we adopted the steps recommended for the construction of an integrative review, which consider: 1) elaboration of the research guiding question; 2) definition of the studies inclusion criteria and database selection; 3) application of a previously produced research instrument for data collection; 4) critical analysis of the included studies; 5) interpretation and discussion of results; 6) presentation of the integrative review conclusion^{12,13}.

Elaboration of the research-guiding question

In spite of the increasing development of mobile health applications, there is a paucity of information about the methodologies used for the development and implementation of these applications. Considering this background, the following guiding research question was formulated as: What are the methodologies used for the development and implementation of mobile applications specifically targeted to children and adolescents with chronic health condition?

Definition of inclusion/exclusion and selection criteria

The inclusion of papers was carried out considering the following criteria: original research, literature reviews (systematic, integrative or narrative) and experience reports, published in English, Portuguese or Spanish, available in full; and presenting the stages of development or implementation/evaluation of the mobile application aimed at the treatment of chronic diseases for children and adolescents. We also included those that, during the reading stage were related to the theme, even when they were not identified in the databases considered. From the initially identified set, we excluded duplicate papers, editorials, congress annals, case studies, and reflection papers.

The search for the articles in the databases and the verification of whether they met the inclusion and exclusion criteria was carried out by two independent researchers, following the reading order: (1) titles of all identified studies; (2) abstracts of the studies selected in the previous phase; (3) complete reading of the selected texts. Disagreements were evaluated in a consensus meeting.

The selection of studies (figure 1) was conducted according to the PRISMA methodology (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*)¹⁴.

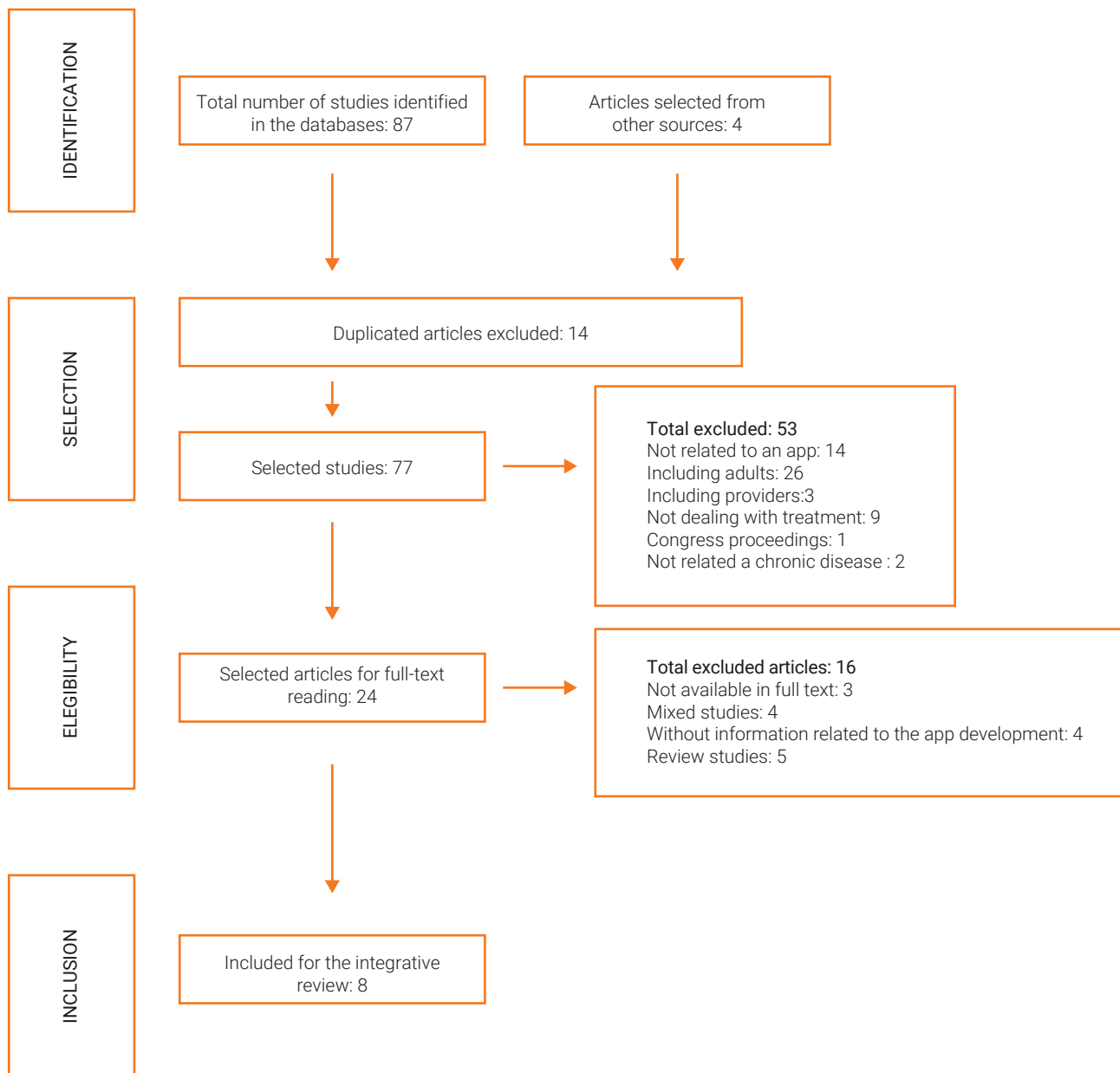


Figure 1. Flowchart of the article selection strategy according to the PRISMA methodology.

Application for the data collection process of a previously built research instrument

After selecting the articles, the study recorded the following data: year and place of publication, title, name of the journal, language, authors, type of study, objective, target population, methodology of creation of the development and/or implementation of the application, guidance on the use of medication, results, conclusions, and limitations. Two independent researchers performed the discussion and presentation of the main research findings. Disagreements were discussed in a consensus meeting.



Critical analysis of included studies

After identification of the set of articles and data collection, the RATS method proposed by Taquette and Minayo¹⁵ was applied to evaluate the consistency of these works (frame 2). The method scale is composed of 15 items distributed by the domains: justified relevance of the study question (3 items), adequacy of the qualitative methodology (3 items), transparency of the procedures (4 items) and soundness of the interpretive approach (5 items). The scale provides a score ranging from 0 to 15 points which classifies the articles into: A - consistent, when they sufficiently score in 12 to 15 items; B - not very consistent, when they are only descriptive or without methodological transparency or with insufficient interpretations, scoring in 8 to 11 items; and C - inconsistent, when they score in seven or fewer items.

Frame 2. RATS framework for the consistency analysis in articles

R	Relevance of the research question (justification)	3 points
1	clear definition of the object and the objective under study	
2	a consistent theoretical reference framework with assumptions	
3	relevant object of study	
A	Adequacy of the qualitative methodology	3 points
4	justification of the chosen method	
5	adequate instruments used, including script items	
6	explicit inclusion criteria	
T	Transparency of procedures	4 points
7	study setting/field entry strategy	
8	description of how the data collection/sampling took place	
9	description of how the data collection was recorded	
10	ethical aspects (including the role of the researcher)	
S	Soundness of interpretive approach	5 points
11	appropriate analysis, how the analyzed material was divided	
12	historical-spatial-social contextualization	
13	clear interpretations, supported by evidence, in dialogue with updated literature	
14	limitations described	
15	well-written, jargon-free text	
	TOTAL	15 points



Results

The databases consulted returned a total of 87 articles meeting the inclusion and exclusion criteria. After reading the contents, four more studies were identified, but they were included because of their importance and relevance to the theme and because their results contributed to the elucidation of the guiding question. From the reading of the abstracts, content and application of the quality criteria, 8 articles were selected to compose the integrative review, which are described in table 3.

The articles analyzed were published between 2014 and 2020 and originated from the USA (3), Australia (2), Canada (1) United Kingdom (1) and South Africa (1). The development focus of these apps considered issues related to self-care for children and adolescents with: chronic pain, asthma, epilepsy, chronic kidney disease, sickle cell anemia, β -thalassemia major, and tuberculosis. The qualitative methodology was identified in 6 articles and the data that contributed to the development of the applications were collected through focus groups, workshops, conversation roundtables, individual interviews and application of questionnaires.

**Frame 3.** Distribution of the selected articles

Title / Author	Year	Topics	Methodology	Results	Conclusions
iCanCope with Pain™: User-centred design of a web- and mobile-based self-management program for youth with chronic pain based on identified health care needs. Authors: Stinson JN, et al. ¹⁶	2014	Mobile, web-integrated APP for self-care of adolescents with chronic pain.	Qualitative research. Focus groups and individual interviews. Adolescents (14-18 years old).	APP was approved as a way to meet the need for education about chronic pain, strategies to control symptoms, and social support. 86% approved the layout.	Self-monitoring of pain, sleep, mood, physical and social activity with production of individual reports and participation in forums assist adolescents in understanding pain and managing symptoms.
Mobile-based asthma action plans for adolescents. Authors: Burbank AJ, et al. ¹	2015	APP for education and treatment monitoring of adolescents with Asthma.	Quantitative research. Quasi-experimental study of the before-and-after type. Adolescents (12-17 years old)	Use of APP 3-4 days per week, high satisfaction, increased effectiveness of Asthma prevention.	APP approved to assist in an action plan for Asthma in adolescents.
Acceptability of an interactive asthma management mobile health application for children and adolescents. Authors: Farooqui N, et al. ¹⁷	2015	APP for asthma self-management for children and adolescents.	Qualitative research, pilot study. Children and adolescents (9 - 16 years)	Improved Asthma prevention and knowledge and treatment adherence	APP approved and contributed to the knowledge and treatment of Asthma.
Desirable Components for a Customized, Home-Based, Digital Care-Management App for Children and Young People With Long-Term, Chronic Conditions: A Qualitative Exploration. Authors: Nightingale R, et al. ¹⁸	2017	APP for care management of children with chronic kidney disease.	Qualitative research. Conversation roundtable and individual interview. Children and adolescents (5-18 years old) and professionals.	Key issues for the APP: easy handling, use of humor, visual appeal, and use of gamification.	Involving children in the development of the APP could maximize its use.
Young People's Preferences for an Asthma Self-Management App Highlight Psychological Needs: A Participatory Study. Authors: Peters D, et al. ¹⁹	2017	APP used in psychological support for young people with Asthma.	Qualitative research. Workshop and individual interview. (Young people 15 -24 years old)	Needs and obstacles of what it is like to live with asthma were pointed out.	The prototype was well evaluated and there was great interest from users for its psychological support.
Utilizing a Novel Mobile Health "Selfie" Application to Improve Compliance to Iron Chelation in Pediatric Patients Receiving Chronic Transfusions. Authors: Leonard S, et al. ²⁰	2017	APP used in education and treatment support for children and adolescents with sickle cell anemia and β -thalassemia major.	Qualitative Research Pilot Study. Children, adolescents and parents.	Users found the APP useful and easy to use. It helped them take their medications. There was a decrease in serum ferritin at 6 months.	Increased adherence to treatment and in retaining knowledge about the disease and its treatment.
EpApp: Development and evaluation of a smartphone/ tablet app for adolescents with epilepsy. Authors: Le Marne FA, et al. ¹¹	2018	APP for education and care of adolescents with epilepsy	Quantitative research Quasi-experimental study Focus Group. Adolescents (13-19 years old)	Improved treatment management and knowledge about the disease. No improvement in self-care was observed.	The APP was found to be useful and attractive and increased knowledge about epilepsy.
Opportunities for Mobile App-Based Adherence Support for Children With Tuberculosis in South Africa. Authors: Morse RM, et al. ²¹	2020	APP to support adherence to tuberculosis treatment in children.	Qualitative research. Experience report and pilot study with children.	An Avatar that grows according to the completion of treatment-related tasks and the creation of goals and rewards can encourage adherence.	The use of APP was able to improve adherence and minimize bad experiences arising from TB treatment.



Evaluation of the quality of the studies

The score provided by the RATS method classified five articles as consistent (Stinson *et al.*¹⁶; Le Marne *et al.*¹¹; Nightingale *et al.*¹⁸; Peters *et al.*¹⁹; Burbank *et al.*¹) while other three (Leonard *et al.*²⁰; Farooqui *et al.*¹⁷ and Morse *et al.*²¹) were rated as poorly consistent. Only the article by Stinson *et al.*¹⁶ received the maximum score. In general, the lack of justification of the chosen method, historical, spatial and social contextualization, and ethical aspects, especially regarding the role of the researcher, contributed to the failure in reaching 15 points of the other articles classified as consistent. The articles classified as not very consistent presented weaknesses for not clearly explaining the inclusion criteria and for not dialoguing with the updated literature, besides the items cited above.

Methods used for the development and implementation/evaluation of the application

Of the 8 articles selected, only Nightingale *et al.*¹⁸ and Stinson *et al.*¹⁶ included the children or adolescents with chronic illness in the app creation, the other authors reported that the apps were developed directly by healthcare professionals specializing in the chronic illness they wished to study or by a technology professional specializing in app development. Le Marne *et al.*¹¹, Peters *et al.*¹⁹, Burbank *et al.*¹, Leonard *et al.*²⁰, Farooqui *et al.*¹⁷, and Stinson *et al.*¹⁶ conducted studies with children and adolescents evaluating the prototypes of the developed apps in order to verify their usability and make necessary adjustments.

Contributions of the apps

The application developed by Stinson *et al.*¹⁶ was well evaluated by the users and met the need of education about chronic pain and symptom control, through resources such as: forums, reminders, use of animations and videos. Nightingale *et al.*¹⁸ verified that the key issues for the development of an application involve: easy handling, use of humor, simple language, relevant content, attractive visuals, and use of gamification. It also found that involving children in the development of the app tends to maximize its use. Peters *et al.*¹⁹ pointed out the needs and obstacles of what it is like to live with asthma, verifying the interest for psychological support by users. Their prototype was well evaluated by young people.

The application developed by Burbank *et al.*¹ was able to increase the effectiveness of asthma prevention and was well evaluated by users and gained approval to assist in an asthma action plan for adolescents. Farooqui *et al.*¹⁷ had the app approved and its use improved knowledge, asthma prevention, and treatment adherence. Leonard *et al.*²⁰ created an app that assisted in taking medications, adherence to treatment, retention of knowledge about the disease and treatment. After 6 months of using the app, a decrease in serum ferritin was observed. Le Marne *et al.*¹¹ observed the increased knowledge about the disease and better



management of epilepsy treatment. Morse *et al.*²¹ reported that the use of technological resources such as the production of an avatar (digital person or character) and a program of goals and rewards might encourage adherence to tuberculosis treatment.

All the apps found in the survey had health education as one of their key focuses, and those that performed the usability evaluation, found increased knowledge about the disease and its treatment.

Discussion

This integrative review had the aim to verify which methodologies are used to create mobile apps for children and adolescents living with chronic diseases, due to the fact that we have observed an increasing use of apps without a correspondence at the same speed of studies that report the experience of creation and validation of these tools. The focus on children and adolescents living with chronic diseases was due to the fact that this population presents characteristics and demands specific to their health conditions, and the development of applications for this specific audience must consider these aspects.

Overall, it can be said that the analyzed apps had objectives focused on health promotion and surveillance, especially incentivizing self-care, motivation for healthy behaviors and psychological support. As a strategy for self-care, treatment adherence and health status monitoring, the selected studies used: sending messages to cell phones as medication and appointment reminders, recording health information (signs and symptoms) by users, recording videos and self-portraits to check whether users' behaviors were in accordance with the recommendations provided by health professionals, and the creation of avatars that have their growth related to treatment adherence.

Mobile applications are widely accepted as innovative digital technologies, by offering convenience and benefits for users and managers through access to health knowledge, through either visual, tactile or auditory stimuli²². The use of smartphones has facilitated people in various daily activities, whether in security, education and health, where it has the potential to minimize problems arising from the lack of professionals and geographical barriers that hinder access to health services.

Through the use of mobile applications it is possible to help improve the delivery of health services, raise awareness and empower patients to become more involved in their treatments therefore expanding autonomy, assisting in promoting healthy habits, providing reminders for medication use, facilitating sending medical data at distance, mediating communication between patients and health professionals, among others, in a personalized way for a large number of users^{11,23}.

An increase in self-care was observed in several studies selected for the integrative review with asthma patients. Burbank *et al.*¹ observed a decrease in asthma attacks; Farooqui *et al.*¹⁷ obtained better adherence to treatment and observed an increase in knowledge about the disease; Peters *et al.*¹⁹ verified that to stimulate self-care, it is necessary to support the users' mental health to manage anxiety, which can even lead to breathing difficulties. In Brazil, asthma is the most prevalent chronic disease among adolescents⁵ and applications such as this can help reduce cases of disease exacerbation.



A chronic disease forces changes in children and adolescents' lives, requiring adaptations and strategies for coping with their health condition. This process depends on the complexity and severity of the disease and the available structures to meet their needs and regain balance²⁴. Regarding those structures available to provide social support, the application developed by Stinson *et al.*¹⁶ includes holding forums that provide an opportunity for adolescents to interact and share coping strategies with other youth. Peters *et al.*¹⁹ propose that an app aimed at young people with asthma should include psychological support to assist in coping with anxiety, lack of autonomy, and social disconnection.

It is noteworthy that the positive acceptance of an application by users is not a guarantee that there will be an improvement in self-care or a change in attitude towards their own health condition. The application developed by Le Marne *et al.*¹¹ in order to inform and assist in the management of epilepsy in children and adolescents showed good acceptance and better medication management, but showed no improvement in psychosocial outcomes (self-care or proactivity toward the disease). Isolated educational interventions to stimulate treatment adherence may be insufficient to improve self-care. The insertion of behavioral elements such as monitoring, goal setting, rewards, and linking treatment to routines may improve outcomes²⁵.

Adherence was analyzed by Leonard *et al.*²⁰ following the administration of an iron chelating agent by sending daily videos and through guidance on sickle cell anemia and β -thalassemia major, allowing greater retention of knowledge and adherence to treatment in addition to a decrease in serum ferritin at 6 months of follow-up.

Patients with sickle-cell anemia and β -thalassemia major need frequent transfusions of red blood cells and, thus, there is usually an iron overload; the excess of this substance in the body is harmful, since iron is deposited in several organs, such as the liver, spleen, and myocardium, causing cell lesions and functional failure, which is the leading cause of death (2/3 of the cases) in patients with β -thalassemia major²⁶. Iron overload can be verified by quantifying serum ferritin and after 6 months of using the application developed by Leonard *et al.*²⁰ observing a drop in serum ferritin; this result is an indication that the use of chelating medication (helps iron excretion) was more efficient after using the application.

It was possible to observe that most authors performed steps such as: conception, development, implementation and evaluation to create a functional application. In addition, all of them considered importance of the participation of the user in the app development process.

The apps developed with the priority participation of children and teenagers tended to privilege issues such as attractive design, use of a simpler and humorous language, and gamification as some of the items that facilitate and stimulate their use. Using a dynamic system, with challenges, points, rewards and rankings, with mechanics similar to games (gamification) increases participation and can generate engagement and commitment from users²⁷.



Gamification lends activities to be more enjoyable, while providing people's engagement with tasks that seem demotivating, and is commonly used in fitness apps and to encourage health behaviors for the treatment of chronic diseases^{28,29}. The use of gamification in apps can imply positive social relationships as it can develop a sense of competition to reach the highest status on the leaderboard, resulting in various emotional skills such as self-satisfaction, self-esteem, and pride, in addition, gamification can help in cognitive development as it stimulates the brain and promotes knowledge acquisition²⁹.

The applications that focused on health professionals tended to emphasize issues related to security and privacy, largely due to the professionals' concern with the possible sharing of cell phones and exposure of issues related to the disease and, consequently, possible embarrassment.

Anyway, regardless of the target audience, the analyzed studies indicate that technical and complex terms should be avoided, and aspects such as ease of use, familiarity with the technology, design, security and privacy, and interaction should be considered. In addition, the participation of multiprofessional teams should be encouraged for the development of applications so that the knowledge can complement each other, including the information that will be generated from the use of applications can help in clinical decision making, enabling more accurate diagnoses and more qualified therapeutic approaches.

A strong point of the study by Nightingale *et al.*¹⁸ was the participatory approach and the use of drawings and existing applications to provide a visual and interactive experience during the interviews, always verbally guided by a researcher. Peters *et al.*¹⁹ also listened to users' opinions about what they liked most and what they did not approve of in other health apps. By flagging the strengths and weaknesses of other apps, users may guide the development of new ones.

The qualitative approach allowed a more detailed exploration of subjective questions such as what kind of information related to their disease they would like to find and what would make them spend more or less time using the app. From these sets of responses, it was found that while users preferred a simpler language, they would like to find information related to various aspects of their own health condition going beyond the basic information that is easily located on any website. The existence of this type of information would make the app more attractive to them.

It is observed that the use of mobile devices sums an additional resource to health care actions, especially directed to children, in which the interaction with virtual and multimedia resources, including interactive games, can motivate and encourage proactive involvement in learning content specific to their own disease^{30,31}.

The adolescence phase is a period of increased exposure to factors such as: alcohol intake, smoking, sedentary lifestyle, stress and obesity; and many of the habits acquired in this phase of life are carried into adulthood along with their health consequences⁵. If health care applications are introduced during adolescence, it may be easier for users to develop healthy habits and improve care related to their chronic health condition when they reach adulthood.



Difficulties reported by the authors in the development of applications

The evaluated articles pointed out difficulties such as, for example, the short period of time to conduct the study and the small sample size, the latter can be considered a characteristic of qualitative research, focusing mostly in an in-depth analysis of the issue studied and not in a quantitative way, the concern with generalizing the results for example, is not the target of qualitative research.

Peters *et al.*¹⁹ and Morse *et al.*²¹ also reported social disadvantages as difficulties, since this aspect, according to the authors, limits access to digital technologies that require mobile equipment compatible with the applications developed and high-speed internet.

Conclusion

It was observed that most of the applications positively influenced the treatment of the chronic diseases studied, there was an increase in adherence and in the improvement of knowledge about the disease, as well as having favored self-care, leading to the prevention of acute conditions and worsening of symptoms. This factor showed that mobile applications aimed at health are important allies in the care of children and adolescents with chronic diseases.

The development of an application for children and adolescents with chronic diseases must consider users within the creative process as well as count on multiprofessional teams. Another relevant point in this process is to provide information that goes beyond that available on search engines, to present relevant issues, with simple language, that is visually attractive and easy to use.

Many obstacles between the population and health services may be overcome with the use of mobile devices, sharing information aimed at health education, prevention, and disease treatment. Most chronic diseases when promptly detected and treated have a better prognosis. In addition, eating and lifestyle habits are mostly acquired during adolescence, so it is important to include early technologies that promote skills and knowledge necessary for patients to play a more active role in managing their health and living conditions.

The integrative literature review allowed us to verify that there is still a scarcity of reports on the development of apps aimed exclusively at children and adolescents with chronic disease in order to produce strong evidence regarding this topic. Strategies for the inclusion of digital technology should consider not only the development of applications, but also encompass the access to compatible mobile devices, training, and high-speed internet to ensure equitable access among the different population profiles that can benefit from this resource. It is important to recognize the needs of children and adolescents with chronic diseases, in order to plan and implement new technologies in a way that is coherent and appropriate to the reality and needs of each one of them to contribute to a safe and effective treatment, additionally improving the quality of life.



Conflict of interest

The authors have no conflict of interest to declare.

Authors' contributions

All authors actively participated in all stages of preparing the manuscript.

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Este artigo apresenta os resultados de uma revisão integrativa de literatura sobre os métodos de desenvolvimento de aplicativos móveis para crianças e adolescentes que vivem com doenças crônicas. Foi analisada a literatura disponível no Medline/PubMed, Web of Science, SciELO, Lilacs e Embase, no período de 2010 a 2020. De 87 artigos identificados nas bases de dados, oito atenderam aos critérios de inclusão e qualidade. Observou-se que o uso do humor, da gamificação e da linguagem simples e visual atraente despertou o interesse e facilita a utilização do aplicativo. A análise da literatura evidenciou que o desenvolvimento de aplicativos para crianças e adolescentes deve reconhecer as necessidades do usuário e incluí-lo em sua criação. Os aplicativos móveis de saúde favoreceram a adesão e o autocuidado e foram importantes aliados no cuidado de crianças e adolescentes adoecidos cronicamente.

Palavras-chave: Aplicativos móveis. Doenças crônicas. Tratamento.

Este artículo presenta los resultados de una revisión integradora de literatura sobre los métodos de desarrollo de aplicaciones móviles para niños y adolescentes en condiciones crónicas de salud. Se analizó la literatura disponible en MEDLINE/PubMed, Web of Science, SciELO, LILACS y EMBASE, en el período de 2010 a 2020. De 87 artículos identificados en las bases de datos, 8 cumplieron los criterios de inclusión y calidad. Se observó que el uso del humor, de la gamificación, lenguaje simple y visual atractivo despiertan el interés y facilitan la utilización de la aplicación. El análisis de la literatura puso en evidencia que el desarrollo de aplicaciones para niños y adolescentes debe reconocer las necesidades del usuario e incluirlo en su creación. Las aplicaciones móviles de salud favorecieron la adhesión y el autocuidado y fueron aliados importantes en el cuidado de niños y adolescentes con enfermedades crónicas.

Palabras clave: Aplicaciones móviles. Enfermedades crónicas. Tratamiento.